

WHAT IS CLAIMED IS:

1                   1.       A method of designing an integrated circuit having digital and  
2 analog circuit portions, said digital and analog circuit portions each having defined  
3 functions, comprising:  
4                   providing an emulation circuit, which is capable of generating noise;  
5                   affixing said emulation circuit on a test substrate;  
6                   providing a version of said analog circuit portion having at least some of  
7 said defined functions of said analog circuit portion;  
8                   affixing said analog circuit version on said test substrate; and  
9                   testing said analog circuit version.

1                   2.       The method of claim 1 further comprising modifying said analog  
2 portion in response to said testing step.

1                   3.       The method of claim 2 further comprising:  
2                   repeating said affixing emulation circuit step, said analog circuit portion  
3 providing step, said analog circuit portion version affixing step and said analog circuit  
4 portion version testing circuit step so that a version of said analog circuit portion having  
5 all of said defined functions of said analog circuit portion, with acceptable response to  
6 said noise effects under operating conditions is obtained.

1                   4.       The method of claim 1 further comprising:  
2                   providing a version of said digital circuit portion having all of said defined  
3 functions of said digital circuit portion; and  
4                   affixing said digital circuit portion version to an integrated circuit  
5 including said version of said analog circuit portion having all of said defined functions of  
6 said analog circuit portion, with acceptable response to said noise effects under operating  
7 conditions.

1                   5.       The method of claim 4 wherein said digital circuit portion  
2 providing step includes testing said defined functions of said digital circuit portion  
3 separately from said analog circuit portion.

1                   6.       The method of claim 5 wherein said digital circuit portion testing  
2 includes programming an FPGA for testing said defined functions of said digital circuit  
3 portion.

1                   7.       The method of claim 5 wherein said digital circuit portion testing  
2 includes simulating said defined functions of said digital circuit portion.

1                   8.       The method of claim 1 wherein said emulation circuit comprises at  
2 least one array comprising at least one shift register.

1                   9.       The method of claim 8, wherein said testing said analog circuit  
2 version is performed while alternately shutting off and turning on at least one array.

1                   10.      The method of claim 8, wherein said shift register comprises:  
2 a plurality of flip-flops, each having a clock input for receiving a clock  
3 input signal, and each storing a data bit; and  
4 a plurality of interconnecting logic blocks, wherein said plurality of flip-  
5 flops couple to each other through said plurality of interconnecting logic blocks  
6 sequentially, and wherein said data bits form a data pattern.

1                   11.      The method of claim 10, wherein said testing said analog circuit  
2 version is performed while applying a signal at said clock input.

1                   12.      The method of claim 11, wherein said testing said analog circuit  
2 version is performed while varying said clock input signal.

1                   13.      The method of claim 10 wherein said testing said analog circuit  
2 version is performed while varying said data pattern.

1                   14.      The method of claim 10, wherein said interconnecting logic blocks  
2 comprise Exclusive-Or gates, and wherein said testing said analog circuit version is  
3 performed while varying said data pattern using said Exclusive-Or gates.

1                   15.      The method of claim 10, wherein said interconnecting blocks  
2 comprise a plurality of logic paths, wherein each logic path is comprised of differing  
3 amounts of logic gates, and wherein said testing of said analog circuit portion is  
4 performed while alternately selecting from among said plurality of logic paths.

1                   16.     The method of claim 10, wherein at least one of said flip-flops is  
2     coupled to an equal number of pads through an equal number of output drivers, which  
3     may be enabled and disabled.

1                   17.     The method of claim 16, wherein said testing of said analog circuit  
2     portion is performed while enabling and disabling said output drivers.

1                   18.     The method of claim 1 wherein said analog circuit portion includes  
2     an RF circuit subportion.

1                   19.     The method of claim 1, wherein a number of gates in said  
2     emulation circuit is substantially equivalent to a number of gates in said digital circuit  
3     portion.

1                   20.     An integrated circuit having digital and analog circuit portions, said  
2     digital circuit portion comprising a digital noise emulation circuit, wherein said digital  
3     noise emulation circuit comprises:

4                   a control block;  
5                   at least one array, which comprises at least one shift register; and  
6                   a plurality of pads.

1                   21.     The integrated circuit of claim 20, wherein each array comprises a  
2     plurality of flip-flops coupled to each other through interconnecting logic blocks.

1                   22.     The integrated circuit of claim 21, wherein said flip-flops and  
2     interconnecting logic blocks are coupled sequentially.

1                   23.     The integrated circuit of claim 22 wherein said control block  
2     comprises:

3                   a plurality of configuration registers;  
4                   at least one input line;  
5                   a decoder block for selecting one of said configuration registers for  
6     updating from said at least one input line.

1                   24.     The integrated circuit of claim 23, wherein said interconnecting  
2 logic blocks comprise a plurality of logic paths, each path comprising a different amount  
3 of logic gates.

1                   25.     The integrated circuit of 24, wherein said plurality of logic paths  
2 are under control of one of said configuration registers.

1                   26.     The integrated circuit of claim 23, wherein said interconnecting  
2 logic blocks comprise an Exclusive-Or gate.

1                   27.     The integrated circuit of claim 26, wherein said exclusive-or gates  
2 receive at least one input from one of said configuration registers.

1                   28.     The integrated circuit of claim 23, wherein at least one flip-flops  
2 couples to an equal number of said plurality of pads.

1                   29.     The integrated circuit of claim 28, wherein said at least one flip-  
2 fops couples to an equal number of said plurality of pads though an equal number of  
3 output drivers.

1                   30.     The integrated circuit of claim 29, wherein said output drivers may  
2 be enabled and disabled by one of said configuration registers.

1                   31.     A method of designing an integrated circuit having digital and  
2 analog circuit portions, said digital and analog circuit portions each having defined  
3 functions, comprising:

4                   providing an emulation circuit, which is capable of generating noise, and  
5 which comprises a plurality of logic elements;

6                   affixing said emulation circuit on said integrated circuit;

7                   providing a version of said analog circuit portion having at least some of  
8 the defined functions of said analog circuit portion;

9                   affixing said analog circuit version on said integrated circuit;

10                  testing said analog circuit version.

1                   32.     The method of claim 31 further comprising modifying said analog  
2 portion in response to said testing.

1                   33.     The method of claim 32 further compromising:  
2                   repeating said affixing emulation circuit step, said analog circuit portion  
3 providing step, said analog circuit portion version affixing step and said analog circuit  
4 portion version testing circuit step so that a version of said analog circuit portion having  
5 all of said defined functions of said analog circuit portion, with acceptable response to  
6 said noise effects under operating conditions is obtained.

1                   34.     The method of claim 31 further comprising reconnecting said logic  
2 elements to provide for said digital portion.

1                   35.     The method of claim 31, wherein said noise generated by said  
2 emulation circuit is substantially equivalent to said digital circuit portion.

1                   36.     An integrated circuit having digital and analog portions, designed  
2 by a process comprising:  
3                   providing an emulation circuit, which generates noise;  
4                   affixing said emulator circuit on a test substrate;  
5                   providing a version of said analog circuit portion having at least some of  
6 said defined functions of said analog circuit portion;  
7                   affixing said analog circuit version on said test substrate; and  
8                   testing said analog circuit version.

1                   37.     The integrated circuit of claim 36, designed by a process further  
2 comprising modifying said analog portion in response to said testing step.

1                   38.     The integrated circuit of claim 37, designed by a process further  
2 compromising:  
3                   repeating said affixing emulation circuit step, said analog circuit portion  
4 providing step, said analog circuit portion version affixing step and said analog circuit  
5 portion version testing circuit step so that a version of said analog circuit portion having  
6 all of said defined functions of said analog circuit portion, with acceptable response to  
7 said noise effects under operating conditions is obtained.

1                   39.     The integrated circuit of claim 36, designed by a process further  
2 comprising:

3 providing a version of said digital circuit portion having all of said defined  
4 functions of said digital circuit portion; and  
5 affixing said digital circuit portion version to an integrated circuit  
6 including said version of said analog circuit portion having all of said defined functions of  
7 said analog circuit portion, with acceptable response to said noise effects under operating  
8 conditions.

1 40. The integrated circuit of claim 36 wherein said emulation circuit  
2 has at least one array comprising at least one shift register.

1 41. The integrated circuit of claim 40, wherein said shift register  
2 comprises:  
3 a plurality of flip-flops, each having a clock input for receiving a clock  
4 input signal, and each storing a data bit; and  
5 a plurality of interconnecting logic blocks, wherein said plurality of flip-  
6 flops couple to each other through said plurality of interconnecting logic blocks  
7 sequentially, and wherein said data bits form a data pattern.

1 42. The integrated circuit of claim 36 wherein said analog circuit  
2 portion includes an RF circuit subportion.

1 43. The integrated circuit of claim 36, wherein a number of gates in  
2 said emulation circuit is substantially equivalent to a number of gates in said digital  
3 circuit portion.